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THE EARTHQUAKE OF DECEMBER 17TH, 1896.

DR. Davison (of 373, Gillot Road, Birmingham) having announced his intention to prepare a memoir upon the above, we purpose passing on to him all the materials which we have collected, or which may be sent to us.

But it would hardly be appropriate that the greatest English earthquake (except the Colchester one) of modern times should not be noticed in these pages.

We, therefore, proceed to give a few salient features, and also our impressions about them—impressions which possibly the thorough discussion, when completed, may show to be unfounded—but of course we do not expect such a result.

For much of the information upon which this article is founded we are indebted to newspapers, and we are fully aware that many persons regard such a source as unsatisfactory. There are, of course, differences in reporters, but we have had exceptional opportunities for verifying newspaper statements, and believe that, judiciously used, they are very valuable. Besides upwards of 400 such reports, we have many from our own correspondents, and it is on this combined mass of material that these remarks are based.

We begin by indicating the wide area over which the shock of 1896 was felt, and the inner area where it was most violent, as shown by damage to buildings (structural damage). These data are shown by the accompanying map, whence we see that it was felt at points as wide spread as Tavistock and Yarmouth; Weymouth and Hartlepool;* Reigate and Beaumaris—and perhaps beyond these limits. Apparently the area affected was 350 miles in diameter, or one of about 100,000 square miles. Nearly central in this there seems to be an elliptical area of about 130 miles, from N. to S., say from Tortworth (Gloucester) to Manchester, and of a greatest breadth of 40 miles, near the latitude of Birmingham, within which structural damage was produced. This area would be nearly 4,000 square miles,—but the chief damage occurred in the southern portion, including parts of the counties of Hereford, Gloucester and Worcester.

* Perhaps this should be Malton—we are not sure that the disturbance at Hartlepool about 5.0 a.m. had any connection with the earthquake.

We think that there is evidence that this shock was one of a series which can be traced for 600 years, but we give the facts and some little sketch maps, and leave our readers to draw their own conclusions.

1248. December 21st. "A little before sunset an earthquake at Bath and Wells, which shook and cast down several high buildings."—*Short's Hist. of Weather*, 1749, *I.*, *p.* 145.

"Foure dayes before Christmas was a great earthquake in Englande, so that the toppes of houses were shaken and throwne downe, wals did cleave, and the heads of chimnies and towers were shaken, but the bodies and foundations stirred not."—*Stowe*, *p.* 188.

"The Cathedral of Wells was much injured."—*Matthew Paris*, V., p. 46.

"The tower of Wells Cathedral thrown down. Cathedral of St. David's partially destroyed, and many churches in Somersetshire damaged."—Meldola & White's *East Anglian Earthquake*, 1885, page 5.

1574. February 26th. "Between 5 and 6 p.m. York, Worcester, Gloucester, Bristol, Herefordshire, and neighbouring counties. Plates and books thrown down at Tewkesbury; Ruthen Castle partly destroyed; Bell in Denbigh market place sounded twice, and several chimneys thrown down. People kneeling in Norton Chapel (near Gloucester?) were almost all thrown down."—*East Anglian Earthquake*, p. 5.

1705. "Extended from Leeds to Bristol, and from Norwich to Liverpool; subterranean noise."–Roper's *Earthquakes*, 1889.

1863. October 6th, about 3.22 a.m. The outside limits indicated by the places mentioned are Dublin, Ulverstone, Scarborough, Market Rasen, Peterborough, Bury St. Edmunds, London, Brighton, I. of Wight, Dorchester, Plymouth, Wicklow, Dublin. The only places at which structural damage occurred, were Ross, Hereford; Worcester, and Congleton.—E. J. LOWE, F.R.S., in *Proceedings Met. Soc.*, 1864, II., p. 55.

1868. October 30th, 10.35 p.m. Outside limits, Blackpool, Nottingham, London, I. of Wight, Tavistock, Bodmin, Pembroke, Lampeter, Blackpool. No structural damage reported and shock feeble."—*Met. Mag.*, 1868, III., p. 153.

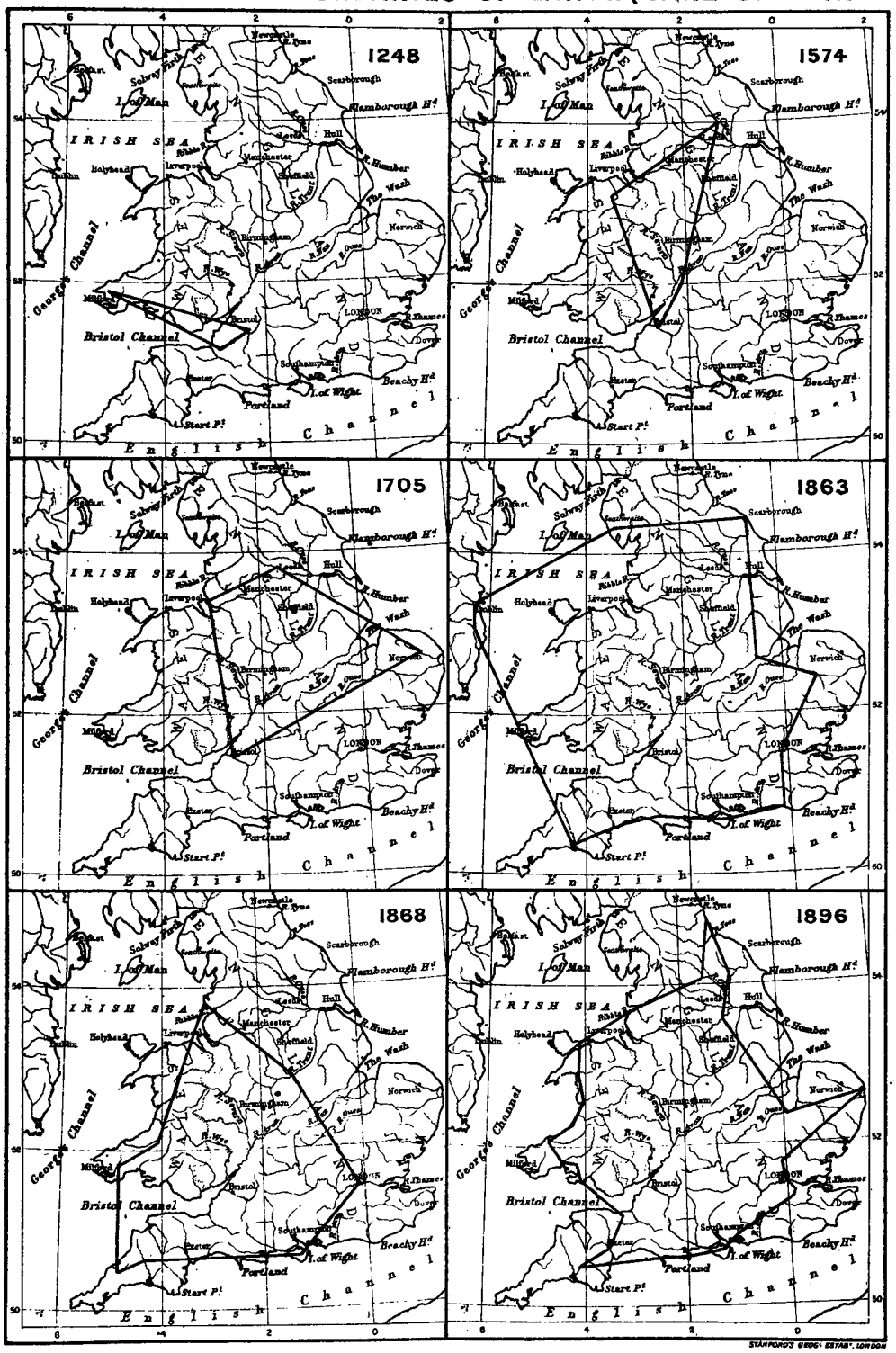
1888. April 11th, 7.10 p.m. Very slight, but felt at Oswestry, Dolgelly, Llangollen and Rhiwbrifdir.—*Meteor. Mag.*, 1888, XXIII., pp. 64, 73.

1892. August 18th, 0.24 a.m. Felt in S.E. of Ireland, all Wales, and in Cornwall, Hereford and Worcester. Damage slight.—*Meteor. Mag.*, 1892, XXVII., p. 113.

1893. November 2nd. Very similar to the shock of 1892.—*Meteor. Mag.*, 1893, XXVIII., p. 152.

The details for 1896 have already been given, and the set of small maps needs no explanation.

APPROXIMATE BOUNDARIES OF EARTHQUAKE SHOCKS.



STANFORD'S GEOG^L ESTAB^T, LONDON

The similarity in the area affected by these shocks seems to us very remarkable. Every place mentioned in 1574 is among those whence we have reports for 1896, and not one of them is outside the 1896 area; and the agreement between the areas of 1863, 1868, and 1896 is extremely close.

As regards violence, and for that district, 1248 seems to have been the worst, next to it 1896, then 1705, 1863, and least of all 1868.

Compared with the Essex shock of April 22nd, 1884, the pecuniary damage in 1896 is much less; but it is spread over an area ten times as great as that to which the 1884 damage was limited; 4,000 square miles against 400.

OBSERVERS' NOTES ON THE 1896 EARTHQUAKE.

MIDDLESEX.

London.—Bartholomew Villas, N.W. Shock felt, time 5.35 a.m. R. INWARDS.

Lower Edmonton.—Jugs rattled more than they could be made to do by walking near them, time 5.35 a.m. PERCY M. BEAREY.

SURREY.

Guildford.—Slight shock felt about 5.45 a.m. M. L. C. MATHEW.

Yorktown.—Was awakened by the shock. T. K. BISHOP.

HERTS.

St. Albans.—Was awake, and felt the shaking begin quite suddenly, continue perhaps half-a-minute, and then as suddenly stop; time within a minute or two of 5.30 a.m. E. A. ORMEROD.

Kensworth.—Furniture, crockery, &c., shaken, at 5.35 a.m. S. GRACE JONES.

BUCKS.

Slough, Upton.—Shock very perceptible. R. BENTLEY.

Slough, Fulmer.—House shook very much, and the pictures on the walls rattled. C. B. FOSTER.

Winslow, Addington.—Shock felt. J. MATHISON.

OXFORD.

St. Giles's.—Shock felt about 5.30 a.m. ELEANOR M. TAWNEY.

NORTHANTS.

Castle Ashby.—Sleepers were awakened by a rumbling noise, like that of a heavily laden waggon, which was followed immediately by a distinct shaking of beds and furniture, about 5.30 a.m. R. G. SCRIVEN.

Pitsford, Sedgbrook.—Shock felt and furniture rattled at 5.34 a.m. C. A. MARKHAM.

Duddington [*Stamford*].—A rumbling sound like that of a traction engine, or furniture being moved, preceded the shock, which threw down a small clock. F. COVENTRY.

HUNTS.

St. Neots, Great Paxton.—Three inmates of the vicarage, in different rooms, felt a shock at 3.30 a.m., and that at 5.30 a.m. was not felt. A. G. CANE.

DORSET.

Langton Herring.—Shock felt distinctly about 5.35 a.m., apparently going from E. to W., and lasting five or six seconds. C. H. GOSSET.

SOMERSET.

N. Cadbury.—Shock much like many I have felt in Patras, apparently going towards S.W., time about 5.32 a.m. H. A. BOYS.

GLOUCESTER.

Bristol, Over Court.—Was awakened by shock which seemed to be shaking the house, and was accompanied by noise, in a second or two it seemed as if the S.E. corner of the house was falling in ruins on the gravel, but daylight showed no injury. R. C. CANN LIPPINCOTT.

Stroud, Upfield.—Distinct shock about 5.30 a.m. ROSE E. STANTON.

Cheltenham (Naunton Park Villas).—The shock occurred about 5.34 a.m., and lasted about 5 secs., direction apparently N.—S. It was preceded by a heavy rumbling noise, and some persons who were awake maintain that they saw a brilliant flash of lightning. My bed was shaken violently, furniture and crockery shook and rattled, and the house bells rang, but no structural damage occurred. W. LLEWELLYN EVANS.

Tewkesbury (Beckford).—Sharp shock at 5.34 a.m.—only one shock, but it lasted 6 or 7 seconds. My bed rocked about as much as a railway carriage going at full speed. The shock was preceded a second or two, and accompanied, by a rumbling not like thunder but more in the earth, somewhat resembling that made by a train passing a wide-span girder-bridge. Doors, pictures, and crockery shook and rattled. F. SLADE.

HEREFORD.

Ross, The Graig.—The most severe shock remembered here, occurred about 5.33 a.m., lasting 8 or 10 secs., and caused some loose chimneys to fall. It was accompanied by a loud rumbling noise like that of a traction engine, steam roller, or motor car. H. SOUTHALL.

SALOP.

Bridgnorth, Quatford House.—I was awoke at 5.31 a.m. by a shaking and by a rumbling sound, which I think lasted about 6 secs. A labourer who works for me has just told me that last night a tumbler was left upside-down on a table, this morning it was found in the same position but with the bottom cut clean off! T. MAYO.

Church Stretton, Woolstaston.—Two shocks were felt here, the first slight, the second at 5.30 a.m. very severe and accompanied by a loud rumbling sound, like a heavy waggon. Furniture and crockery violently shaken. E. DONALD CARR.

Wem, The Clive Vic.—Shock at 5.35 a.m., with lightning, causing crockery to rattle, and making game and other birds crow and cry. J. COOPER WOOD.

WORCESTER.

Malvern.—I was awakened by my bed oscillating and the fire-irons rattling for several seconds; there was also a rumbling noise; time a little before 5.35 a.m. C. S. PRINGLE.

Orleton.—Severe shock about 5.37 a.m. T. H. N. DAVIES.

LEICESTER.

Barkby.—Considerable shock at 5.35 a.m. E. N. POCHIN.

LANCASTER.

Garstang, Bruna Croft.—At, or about, 5·35 a.m., having been awake about ten minutes, I heard the water jug, full of water, shake in the basin, and the window rattle slightly, this went on for some six to ten seconds.

I immediately said, "Why that must be an earthquake," because though trains three-quarters of a mile distant sometimes make the windows rattle, they never affect the water jug. SYDNEY WILSON.

Garstang, Elswick Lodge.—Slight shock between 5.30 and 5.35 a.m. S. KING.

MONMOUTH.

Llanfrechfa.—Slight tremors about 5.30 a.m., and noise as of a heavy waggon on a hard road. F. J. MITCHELL.

CARMARTHEN.

Llandovery.—Shock felt about 5.40 a.m. J. WATKINS.

PEMBROKE.

Haverfordwest.—Slight shock about 5.30 a.m. E. P. PHILLIPS.

MERIONETH.

Rhiwbrifdir.—Shock felt about 5.30 a.m. R. ROBERTS.

CARNARVON.

Llanystumdwy, Talavor.—Shock about 5·35 a.m. J. ROBERTS.

Llandudno.—Slight shock about 5.30 a.m. J. NICOL.

TIME.

Here, as in every previous earthquake, there is ample proof of the carelessness of most persons as to keeping accurate time, and of the tendency to quote round figures (*e.g.*, 5.30 or 5.40) rather than accurate ones.

It will be for Dr. Davison, if he can, to bring order out of chaos; meanwhile we offer the following as our impression of what was the initial time of the disturbance—viz., 5.32 a.m.—and the rate of progress, 30 miles per minute from Hereford as a centre.

The following records* all agree with the above conditions within one minute :—

Within 30 *miles of Hereford,* 5.32 *a.m.*

Glasbury, Radnor, A. Battiscombe 5.33	Monmouth, Monmouth, C. H. Culley 5.32
Hereford, Hereford, W. Pilley 5.32	Ross, Hereford, H. Southall 5.33
Kinnersley, ,, *Press* 5.33	Tewkesbury, Gloucester, Rev. E. H. Cosens 5.32
Ludlow, Salop, *Press* 5.32	Worcester, Worcester, *Nature* 5.31

30 *to* 60 *miles from Hereford,* 5.33 *a.m.*

Bath, Somerset, Rev. H. H. Winwood 5.32	Cardiff, Glamorgan, A. Mee 5.32
N. Cadbury, Somerset, Rev. H. A. Boys 5.32	Cheltenham, Gloucester, Rev. M. A. Smelt 5.33
Birmingham, Dr. Davison 5.32½	,, W. Ll. Evans 5.34
Bristol, Gloucester, *Press* 5.34	Kidderminster, Worcester, *Press* 5.32
	Neath, Glamorgan, Signalman 5.33

* Of course, it may be said that by selecting your figures you can prove anything. We admit the general proposition, but are sure that in this case it does not apply, because nearly all the best observers appear in this list. It would be invidious to set out their qualifications, but there is the Director of Kew Observatory, there are several Fellows of the Royal Astronomical and Royal Meteorological Societies, and—to our mind, strongest fact of all—there are the only railway signalmen whose reports we have seen, men who were bound to be awake, bound to have their clocks right, and bound to record time accurately by day and by night.

60 *to* 90 *miles from Hereford*, 5.34 *a.m.*

Barkby, Le'ster, Rev E. N. Pochin 5.35
Derby, Derby, *Press* 5.33
,, ,, ,, 5.34
Dunton Bassett, Leicester, Rev. A. Chiswell 5.34
Leicester, Signalman 5.34
Oxford, Oxford, *Press* 5.35
Sedgbrook, Northants, C. A. Markham 5.34
Talarvor, Carnarvon, J. Roberts 5.35
Whitchurch, Salop, *Press* 5.35
Witney, Oxford, *Press* 5.35

90 *to* 120 *miles from Hereford*, 5.35 *a.m.*

Attercliffe, Yorks, *Press* 5.35
Bolton, Lancashire, W. W. B. Hulton 5.35
,, ,, W. W. Midgley 5.35
Chorlton-cum-Hardy, H. Whale 5.35
Didsbury, Lancashire, *Press* 5.35
Edgeware, Middlesex, Judd 5.35
Hitchin, Herts, *Press* 5.35
Kensworth, Herts, J. Jones, 5.35
Kew Obsy., Surrey, Dr. Chree 5.35
Manchester, *Press* 5.36
Manchester (St. Bede's), Rev. L. C. Casartelli 5.35
Melton Mowbray, Le'ster, *Press* 5.35
Pinner, Middlesex, F. H. Mabbett 5.34
Preston, Lancashire, Dr. Brown 5.35
Watford, Herts, Dr. Attfield, F.R.S. 5.34
Weymouth, Dorset, Rev. C. H. Gosset 5.35
Wilmslow, Cheshire, W. Mann 5.35

120 *to* 150 *miles from Hereford*, 5.36 *a.m.*

Castleford, Yorks, *Press* 5.36
Dulwich, Kent *Press* 5.37
Edmonton, Middlesex, P. M. Bearey 5.35
Garstang, Lancashire, S. Wilson 5.35
Hellifield, Yorks, Signalman 5.35
Leeds, Yorks, *Press* 5 35
London (City), E. Lionel Scott 5.35
,, (Highbury), C. Nicoll 5.35
,, (Kentish Town), R. Inwards 5.35
Nutfield, Surrey, H. Nicholls 5.37
Wisbech, Cambridge, A. Peckover 5.35

Minor Shocks.

Prof. Milne's seismometer shows tremors for several hours before the great shock, and he has asked whether anyone felt shocks during those hours. We submit a few records without guaranteeing their accuracy, because they may indicate where inquiry should be made.

2.10. *Evesham, Worcester.*—"Two shocks; (1), 2.10 a.m.; (2), 5.40 a.m."

3.0. *Clifton-on-Teme, Worcester.*—"A few inhabitants were startled by a slight earthquake at 3 a.m.; at 5.30 there was a severe one."

3.15. *Much Wenlock, Salop.*—"Slight shock 3.15, and violent one at 5.35."

3.50. *Malvern, Worcester.*—"A shock is said to have been felt at 3.50 a.m."

3.50. *Malvern, Worcester.*—"I got up at the first shock at 3.50, thinking that some one had knocked."—J. G. Powell, Coombe Lodge.

4.0. *Wolverhampton.*—"Two shocks, one about 4 a.m., the other an hour later."

4.15. *Droitwich, Worcester.*—"Slight shock at 4.15; very severe at 5.35 a.m."

4.20. *Droitwich, Worcester.*—"Shock at 4.20, slight."

4.30. *Cardiff.*—There seem to have been two shocks, one about 4.30, and the other an hour later."

5.0. *Whitchurch, Salop.*—"Two shocks; one at 5.0, the other more severe at 5.37."

5.50. *Dulwich, Surrey.*—"About ¼ hour after the great shock, there was another, very slight."

5.57. *Southampton.*—"Two shocks here; (1), 5.40; (2), 6.3. [As his first time shows his clock to be 6 m. fast, we have entered the second shock as 5.37.]"

Luminous Phenomena.

We do not think that the evidence upon this head proves more than that there was a local thunderstorm at about the same time as the shock. We accept no responsibility for the following statements, but give all that we have seen, and leave our readers to determine their value.

Kinnersley, Herefordshire.—"There was noticed to be a very clear light during the time the shock was on."

Bridgnorth, Salop.—"Previous to the disturbance the streets seemed to be on fire!"

Wem, Salop.—"Shock at 5.35 a.m., with lightning."—J. Cooper Wood.

Evesham, Worcester.—"Directly the vibration ceased, a brilliant light appeared in the sky, and this continued for an appreciable time."

Evesham, Worcester.—"A few persons state that at the time of the shock there was apparently a flash of lightning."

Kidderminster, Worcester.—"The shocks were preceded by a luminous flash lighting up the northern sky."

Worcester.—"Alderman Price believes that there was a flash of lightning at the time, and others confirm this."

Liverpool.—"There was a heavy thunderstorm, accompanied by vivid lightning and terrific hail, followed by an earthquake."

Liverpool.—"A thunderstorm followed the earthquake in about 15 minutes."—F. W. Saxby, 42, Lidderdale Road.

Manchester.—"Several men who were setting out for their work at Stretford, state that they saw a red light in the sky, in the direction of Warrington; they heard no sound, but thought that some chemical works must have been blown up."

Warrington.—"The earthquake here at 5.35 was preceded by a loud clap of thunder at 5.30 a.m."

Widnes.—"The earthquake was followed by a thunderstorm."

Malton, Yorks.—"At 5.30 a.m. I was driving from Terrington to Welburn, and when south of Brandreth Farm, near Bulmer, both my groom and I saw a sudden flash of light veiled in the fog, which I at first took to be lightning, but afterwards concluded to be the reflection from a meteor. . . . Is it possible that we were at the edge of the disturbance, and that the flash of light was part of the lightning of the thunderstorm experienced in the vicinity of Widnes and Liverpool?"—John Dougall, M.D., The Grange, Welburn, York.

Knighton, Radnor.—"People out of doors say that there was a great flash of lightning at the time, which fairly lighted up the place."

Newtown, Montgomery.—"A shock of earthquake was felt here, after a stormy night, with vivid lightning."

Rhyl, Flint.—"The shock was followed by a hail storm."

Ruthin, Denbigh.—"The driver of the mail coming through Llanbedr at the time [of the shock] reported thunder and lightning.

SOUND.

It is, we believe, denied that any sound is produced by an earthquake. We could quote 200 reports of sound in connection with the present one, but we should probably be told (1) that persons suddenly awakened are not competent recorders of physical phenomena, (2) that the noise may be accounted for by the creaking of the timbers of houses when they are being shaken.

We quote some statements by persons who were awake, and who heard noise before they felt anything.

Father Vincent McNabb, who was standing in his room at the Dominican Priory, Woodchester, Stroud, says: "After a distant sound, I noticed slight trembling of the walls and floor. Sound and motion increased in volume until I thought that some heavy cart was rumbling over the tiled cloister."

A Tewkesbury correspondent says: "I was lying awake when I heard a distant rumbling, the sound getting nearer and nearer, till it felt like a traction engine close by."

Mr. Walter Pilley, of Hereford, who was just going out, says: "At 5.32 a.m. I heard a peculiar rumbling noise, as of a traction engine, then followed two terrific crashes, the second appearing to be louder than the first; succeeding this, the house seemed to be lifted and rocked."

An observer at Eardisley, Hereford, distinctly differentiates, in the following words, the noise of the earthquake, and that of the straining of the house: "The rumbling noise lasted about 3 secs., and terminated with a sudden shock, which made the beams of the house creak and the windows rattle."

From Ledbury we hear: "Its first warning was a noise as of a sudden rising of the wind, which during the night had been unusually quiet; this noise increased with great force, and was immediately accompanied by a tremendous shaking of houses, &c."

The following letter is self explanatory.

To the Editor of the Standard.

SIR,—In a Leading Article in *The Standard* of Friday last, relating to the late earthquake, you state that "Several correspondents of a class accustomed to observe accurately, and who may be assumed to record their observations without exaggeration, distinctly assert that the tremors were neither preceded nor accompanied by any unusual noise." I may say that, in this district at any rate, the shock was announced by a loud rumble, not unlike the sound of a fast train passing close to the house of the observer. The sound awoke me, and was heard by two more of the family. This rumble was immediately followed by a violent shaking of the premises, which lasted about 20 secs.—I am, Sir, your obedient Servant,

R. V.

Little Hereford, Tenbury, December 20th.

The report from Ludlow is—"The approach of the shock was indicated by a loud rumbling noise, which grew louder, and then there was a severe shaking of the earth."

We have many similar statements, but we will give only one more—the graphic, characteristic, and, as regards the sound, apparently unanswerable statement of Father Ignatius as to the occurrence at Llanthony Abbey, Abergavenny, Mon. "This morning [*i.e.*, before he could have received outside information.—ED.], while our community were in church between 5 and 6, at the usual morning service, very strange phenomena startled us all. 'Suddenly there came a sound as of a rushing mighty wind,' and then twice 'the place was shaken where they were assembled together,' the whole lasting about 8 secs. There was no feeling, but only 'the sound of a mighty rushing wind.' There was no rumbling underground, but the whole massive building and everything in it swayed violently twice. I at once ordered everyone to leave the building. . . . . The remarkable portion of the experience was the rushing sound in the air that preceded the shocks. It seems that there must have been some tremendous body of meteors rushing through the air, and then, coming in contact with the ground, they produced the shocks."

REVIEWS.

Die Beurtheilung des Wetters auf mehrere Tage voraus. von Dr. W. J. VAN BEBBER. Sm. 8vo. Stuttgart: F. Enke, 1896. 52 pp., 8 maps.

AN interesting and popularly written paper upon the possibility of forecasting the weather for "several days," instead of, as is now done by most Government establishments, for "one day."

This is not the place to discuss the amount of success which attends the official forecasters; and Dr. van Bebber will at once admit that his "several days'" forecasts must of necessity be less certain of fulfilment than those for "one day."

Assuming, however, that the ordinary "one day" forecasts are a success, evidently "several days" forecasts which approach success would be very useful.

Dr. van Bebber has had long experience of the ordinary system, and has studied, probably as carefully as anyone, the normal paths of depressions across Europe; he thinks that those studies prove that these paths can be anticipated, and of course, if so, then the weather for "several days" can be foretold.

We hope that it is so; but our impression is that if Dr. van Bebber instead of living at Hamburg had lived at Valencia, his views would have been somewhat less firmly held.

On a Whirlwind at Bloxworth [*Dorset*], by the Rev. O. PICKARD-CAMBRIDGE, M.A., F.R.S. (Proc. Dorset Natural History and Antiquarian Field Club). 8vo. Dorchester, 1896. 4 pp., 3 plates.

AN excellent account of the damage wrought by a whirlwind on the night of November 10th, 1895. It is illustrated by a map on the scale of five inches to a mile, and by two photo-blocks of the wrecked trees. The track was S.W.–N.E., about a mile long, and from 80 to 100 yards in breadth.

Round the Year: a Series of short Nature Studies by PROF. L. C. MIALL, F.R.S. London: Macmillan & Co., 1896, sm. 8vo., 295 pages.

THIS is the most Gilbert-Whitish book that we have seen for a long time. Like "The Natural History of Selborne" it is chiefly devoted to notes on animal and vegetable life; but, like it, running off into bits of meteorology, fogs, snow and snow crystals, underground temperature, &c. The parallelism between the two writers is so great that we are surprised that Crag Foot does not appear as Selborne does, among the list of rainfall stations.

To those who have eyes to see, and desire to know something of the world in which they live, and who wish for an able and cheerful companion, we say, "Read *Round the Year.*" The book is so fascinating to lovers of nature that they will feel great reluctance to lay it down before they have read to the end.

CIEL ET TERRE.

WE congratulate M. Lancaster and his co-Editors of *Ciel et Terre* upon obtaining a unique distinction.

M. Mailly was a member of the staff of the Royal Observatory of Bruxelles, and also a member of the science section of the Royal Academy of Belgium; he died in October, 1891, and left 10,000 francs (£400) to the Royal Academy to found a prize to be awarded to the Belgian who had made some astronomical discovery, or had contributed to the progress of astronomy in the country.

The Royal Academy accepted the legacy, founded the "Mailly prize" of 1000 francs (£40), to be granted each four years, and on December 15th, 1896, awarded the first prize to the Editors of *Ciel et Terre.*

RAINFALL AT OVINGTON, ENNERSDALE, NATAL.

Lat 29° S. Lon. 29½° E. Altitude 3715 ft. ?

By the Rev. A. H. Stocker.

	Monthly Depth.					Number of Wet Days.					Averages for 5 Years.	
	1891 to 1892	1892 to 1893	1893 to 1894	1894 to 1895	1895 to 1896	1891 to 1892	1892 to 1893	1893 to 1894	1894 to 1895	1895 to 1896	Rain.	Days.
	in.	in.	in.	in.	in.						in.	
July	·20	·07	·19	—	—	3	1	3	—	—	·09	1
Aug.	·11	1·70	·33	·71	·11	6	5	4	5	2?	·59	5
Sept.	·56	2·94	5·64	2·46	·83	6	7	13	7	3	2·49	7
Oct.	3·50	6·00	4·75	1·13	·79	16	19	15	10	4	3·23	13
Nov.	1·78	4·18	*12·05*	3·54	3·08	15	12	16	11	9	4·93	13
Dec.	5·57	3·06	6·10	3·19	7·97	16	8	18	16	18	5·18	15
Jan.	3·46	6·84	9·21	3·25	4·93	12	20	14	18	12	5·54	15
Feb.	4·10	4·06	4·66	6·96	7·33	14	12	10	12	14	5·42	12
Mar.	3·24	4·56	2·68	5·00	1·83	17	17	13	17	9	3·46	15
April	1·18	1·34	2·68	·54	3·26	6	4	7	8	8	1·80	6
May	·47	·14	·71	·27	·79	7	2	8	4	2	·48	5
June	—	·06	·25	—	·71	—	1	2	—	2	·20	1
	24·17	34·95	49·25	27·05	31·63	118	108	123	108	83	33·41	108

Note.—In 1895 there was an absolute drought for 92 days, from May 20th to August 19th ; and in 1896 one for 52 days, from June 17th to August 7th.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	88·7	14	47·7	2, 29	77·5	55·2	52·6	65	133·0	41·1	1·03	7	...
Malta	103·0	19	63·3	1	87·7	69·0	65·6	66	150·7	58·1	·00	0	1·5
Mauritius	75·4	1	57·0	5	72·9	62·9	58·5	74	123·7	46·6	1·82	20	5·1
Calcutta	91·9	1	77·5	21	88·4	79·3	78·5	87	158·8	76·3	12·08	19	8·5
Bombay	87·6	6	75·1	21	84·2	77·6	76·6	87	137·9	70·2	36·44	31	9·3
Ceylon, Colombo	88·4	6	73·5	25	86·6	78·2	75·4	85	155·0	71·5	2·85	10	7·0
Melbourne	61·0	3	32·9	31	54·1	42·4	41·2	77	109·5	23·0	2·00	18	5·8
Adelaide	68·4	3	34·4	10	58·6	42·1	41·4	75	124·2	26·4	1·26	18	6·0
Sydney	66·9	5	39·8	2	56·1	43·9	77·0	80	103·0	27·9	2·53	10	3·5
Wellington	59·0	19	36·0	21	54·7	43·9	41·8	75	110·0	23·0	5·83	20	4·5
Auckland	64·0	9	42·0	17	57·9	47·3	44·8	76	119·0	38·0	8·70	30	6·5
Jamaica, Kingston	93·9	13	69·6	1	89·8	74·4	70·4	68	...	...	·99	6	...
Trinidad	92·0	10*a*	69·0	var.	88·2	70·5	73·5	83	174·0	68·0	6·35	22	...
Grenada	85·2	29	70·0	7	82·5	74·4	71·1	81	149·2	...	10·75	28	3·5
Toronto	91·3	12	47·2	16	80·0	59·4	59·3	72	106·0	40·0	2·18	10	5·0
New Brunswick, Fredericton	90·7	2	46·0	18	77·5	54·0	56·8	68	...	...	3·80	10	5·0
Manitoba, Winnipeg	90·5	1	42·7	23	75·9	53·7	...	...	...	...	2·01	11	6·0
British Columbia, Esquimalt	78·2	5	44·2	29	71·2	51·1	54·1	85	...	...	·00	0	3·0

a—and 13.

REMARKS.

MALTA.—Adopted mean temp. 77°·6, or 0°·1 above the average. Mean hourly velocity of wind 7·0 miles. Average temp. of sea 77°·3. TS on 13th. L on 21st.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2, of dew point 0°·9, and rainfall ·48 in., below, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·4 mile below average; extremes, 26°·4 on 11th, and 2·0 on 1st; prevailing direction, E.S.E. T. F. CLAXTON.

Adelaide.—Mean temp. 1°·2, and rainfall 1·43 in., below the average of 39 years. A dry winter generally, especially in the north, after a dry hot summer.
C. TODD, F.R.S.

Sydney.—Rainfall 1·71 in., temperature 2°·4 below, and humidity 3·3 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine in the early part of the month, with showers at intervals; the latter part very wet. Maximum rainfall on 25th, 1·23 in. Winds throughout light and variable; frequent calms; several frosty nights. T on 14th. H on 19th, and fog on 7th and 21st. Temperature 1°·7 above, and rainfall ·51 in. below, their respective averages. R. B. GORE.

Auckland.—A rainy and stormy month, the total rainfall being nearly three inches in excess of the average of 30 years. Mean temp. slightly above the average.
T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 4·4 miles. Kingston rainfall about half the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 3·10 in. below the 30 years average. J. H. HART.

SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	5·22	XI.	Lake Vyrnwy	6·21
,,	Birchington, Thor	3·62	,,	Corwen, Rhug	5·08
,,	Hailsham	4·95	,,	Criccith, Talarvor.....	5·76
,,	Ryde, Thornbrough	4·92	,,	I. of Man, Douglas	7·28
,,	Emsworth, Redlands ...	4·34	XII.	Stoneykirk, Ardwell Ho.	5·13
,,	Alton, Ashdell	5·19	,,	New Galloway, Glenlee	7·68
III.	Oxford, Magdalen Col..	3·03	,,	Lilliesleaf, Riddell	4·79
,,	Banbury, Bloxham	3·74	XIII.	N. Esk Res. [Penicuick]	5·85
,,	Northampton, Sedgebrook	3·37	,,	Edinburgh, Blacket Pl..	3·35
,,	Alconbury	2·59	XIV.	Glasgow, Queen's Park..	4·85
,,	Wisbech, Bank House...	3·10	XV.	Inverary, Newtown	8·74
IV.	Southend	2·63	,,	Oban, The Corran	7·70
,,	Harlow, Sheering..... ...	...	,,	Islay, Gruinart School...	2·09
,,	Colchester, Lexden	2·72	XVI.	Dollar.....	5·87
,,	Rendlesham Hall	2·56	,,	Balquhidder, Stronvar...	10·52
,,	Rushall Vicarage	3·51	,,	Ballinluig	6·08
,,	Swaffham	4·01	,,	Dalnaspidal H.R.S.....	8·84
V.	Salisbury, Alderbury ...	5·31	XVII.	Keith H.R.S.....	5·43
,,	Bishop's Cannings	4·04	,,	Forres H.R.S.	2·50
,,	Blandford, Whatcombe .	6·60	XVIII.	Fearn, Lower Pitkerrie..	2·81
,,	Ashburton, Holne Vic...	9·61	,,	N. Uist, Loch Maddy ...	4·94
,,	Okehampton, Oaklands.	8·46	,,	Invergarry.....	7·28
,,	Hartland Abbey	7·14	,,	Aviemore H.R.S.	3·25
,,	Lynmouth, Glenthorne.	7·93	,,	Loch Ness, Drumnadrochit	3·41
,,	Probus, Lamellyn	9·22	XIX.	Invershin	2·45
,,	Wellington, The Avenue	6·09	,,	Scourie	3·60
,,	Wincanton, Stowell Rec.	5·76	,,	Watten H.R.S.....	4·10
VI.	Clifton, Pembroke Road	4·11	XX.	Dunmanway, Coolkelure	12·92
,,	Ross, The Graig	3·47	,,	Cork, Wellesley Terrace	6·47
,,	Wem, Clive Vicarage ...	3·04	,,	Killarney, Woodlawn ...	7·66
,,	Cheadle, The Heath Ho.	4·40	,,	Caher, Duneske	5·87
,,	Worcester, Diglis Lock	2·65	,,	Ballingarry, Hazelfort..,	4·12
,,	Coventry, Coundon	3·60	,,	Limerick, Kilcornan ...	3·60
VII.	Ketton Hall [Stamford]	...	,,	Broadford, Hurdlestown	4·09
,,	Grantham, Stainby	3·96	,,	Miltown Malbay	6·27
,,	Horncastle, Bucknall ...	3·55	XXI.	Gorey, Courtown House	7·82
,,	Worksop, Hodsck Priory	2·55	,,	Athlone, Twyford	5·02
VIII.	Neston, Hinderton	3·07	,,	Mullingar, Belvedere ...	5·86
,,	Southport, Hesketh Park	4·37	,,	Longford, Currygrane...	4·84
,,	Broughton-in-Furness ...	8·49	XXII.	Woodlawn	6·61
IX.	Ripon, Mickley.....	4·15	,,	Crossmolina, Enniscoe ..	7·56
,,	Melmerby, Baldersby ...	3·37	,,	Collooney, Markree Obs.	5·20
,,	Scarborough, Obs.	2·71	,,	Ballinamore, Lawderdale	5·59
,,	Middleton, Mickleton ...	3·85	XXIII.	Lough Sheelin, Arley...	4·31
X.	Haltwhistle, Unthank...	3·84	,,	Warrenpoint.....	6·59
,,	Bamburgh	4·94	,,	Seaforde.....	5·95
,,	Keswick, The Bank.....	5·67	,,	Belfast, Springfield	5·73
XI.	Llanfrechfa Grange	6·84	,,	Bushmills, Dundarave..	4·22
,,	Llandovery	7·49	,,	Stewartstown	4·34
,,	Castle Malgwyn	9·54	,,	Killybegs	7·52
,,	Builth, Abergwesyn Vic.	12·68	,,	Lough Swilly, Carrablagh	4·54
,,	Rhayader, Nantgwillt...	10·08			

DECEMBER, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	3·61	+ 1·54	·75	2	21	51·8	26	26·6	19	12	23
II.		Maidstone (Hunton Court)...	3·15	+ ·91	·70	13	16	...	...	...	...	..	...
,,		Strathfieldsaye	4·75	...	1·04	4	19	...	...	...	...	...	...
III.		Hitchin	3·21	+ 1·18	·65	4	23	53·0	26	26·0	18	13	...
,,		Winslow (Addington)	3·59	+ 1·14	·62	4	25	51·0	26*b*	23·0	24	13	17
IV.		Bury St. Edmunds (Westley)	3·82	+ 1·58	·79	4	21	52·0	26	26·0	19*g*	..	...
,,		Norwich (Brundall)	3·25	...	·33	4	26	52·2	26	24·8	19	10	24
V.		Weymouth(LangtonHerring)	5·65	+ 2·55	·81	5	23	50·0	28	26·0	21	8	...
,,		Torquay (Cary Green)	7·37	...	1·43	1	24	54·1	28	29·0	18	4	9
,,		Polapit Tamar [Launceston]..	6·72	+ 2·49	·81	13	25	52·4	26	22·0	18	8	11
VI.		Stroud (Upfield)	3·60	+ 1·15	·59	4	24	51·0	30	27·0	17	13	...
,,		ChurchStretton(Woolstaston)	4·40	+ 1·35	·81	4	23	51·5	26	23·5	1	12	24
,,		Tenbury (Orleton)	3·78	+ 1·41	·68	4	19	55·3	26	21·8	24	12	17
VII.		Leicester (Barkby)	3·37	+ 1·23	·48	4	24	52·0	26*c*	21·0	23	19	26
,,		Boston	2·68	+ ·83	·30	1*a*	22	50·0	25	26·0	16	9	...
,,		Hesley Hall [Tickhill].....	2·41	+ ·43	·44	4	20	55·0	26	20·0	1	16	...
VIII.		Manchester(PlymouthGrove)	3·56	+ ·12	·50	26	20	50·0	10	26·0	21*h*	17	18
IX.		Wetherby (Ribston Hall) ...	2·15	— ·29	·61	5	10	...	...	...	...	...	...
,,		Skipton (Arncliffe)	9·66	+ 2·85	1·63	29	22	..	...	...	...	...	...
,,		Hull (Pearson Park).	3·76	+ 1·49	·67	2	22	54·0	27	21·0	1	15	18
X.		Newcastle (Town Moor)	4·60	+ 2·30	·50	27	21	...	..	...	...	...	...
,,		Borrowdale (Seathwaite).....	19·27	+ 4·46	4·59	29	23	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	7·59	+ 3·04	·87	27	24	...	...	...	...	...	...
,,		Haverfordwest	8·85	+ 3·86	·91	10	29	52·0	7	25·9	18	4	20
,,		Aberystwith (Gogerddan) ...	6·16	+ 1·28	·93	6	25	48·0	30	16·0	17	...	...
,,		Llandudno.....	4·19	+ 1·23	·89	6	25	55·4	26	29·5	21	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·86	+ 1·84	·89	29	17	53·0	26	21·6	1	14	...
,,		Jedburgh (Sunnyside).....	4·02	+ 1·82	1·50	17	22	52·0	26	18·0	1	14	...
XIV.		Colmonell	7·22	...	1·06	29	21	53·0	8	20·0	17*i*	13	...
XV.		Lochgilphead (Kilmory).....	8·01	+ ·64	1·19	29	21	...	...	20·0	16	15	...
,,		Mull (Quinish).....	6·48	— 1·09	1·00	25	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices	6·30	+ 2·99	·90	26	18	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·25	+ 3·17	·70	6	24	54·1	26	23·6	1	12	...
XVII.		Braemar	4·51	+ 2·04	·73	4	23	50·8	26	9·3	23	20	24
,,		Aberdeen (Cranford)	7·25	...	1·03	6	24	54·0	26	25·0	15	14	..
,,		Cawdor (Budgate)	2·80	+ ·34	·48	6	19	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·31	— 1·46	·81	4	12	...	...	...	...	...	...
,,		Glencarron Lodge.....	7·13	...	1·29	30	21	51·6	26	19·0	18	14	...
XIX.		Dunrobin	3·88	+ ·51	·77	6	17	51·5	26	28·0	18	9	...
,,		S. Ronaldsay (Roeberry).....	5·28	+ 1·62	·90	10	25	48·0	25*d*	29·0	17	5	...
XX.	IRELAND.	Darrynane Abbey.....	7·31	...	·90	13	27	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	8·48	+ 4·84	1·47	8	23	51·5	2*e*	26·0	18	14	...
,,		O'Briensbridge (Ross)	6·23	...	·93	25	21	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	6·82	+ 3·70	1·37	8	23	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	4·19	+ 2·03	1·39	8	20	57·6	26	27·0	18*g*	5	23
XXII.		Ballinasloe	5·76	+ 2·34	·99	29	24	52·0	26	19·0	19	14	...
,,		Clifden (Kylemore)	12·35	...	1·82	29	27	...	...	...	...	...	...
XXIII		Waringstown	4·82	+ 1·78	·92	27	23	54·0	25	18·0	19	20	25
,,		Londonderry (Creggan Res.).	3·99	— ·22	·60	29	26	...	...	...	...	...	...
,,		Omagh (Edenfel)	4·57	+ ·89	·74	29	20	50·0	25*f*	14·0	19	18	25

+Shows that the fall was above the average ; —that it was below it.

a—and 10. *b*—and 30, 31. *c*—and 28, 30. *d*—and 26. *e*—and 27, 31. *f*—and 29, 30. *g*—and 20. *h*—and 24. *i*—and 19.

METEOROLOGICAL NOTES ON DECEMBER, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—A wet month, generally mild during the day, except from the 16th to the 22nd. From the 26th to the end, max. temp. rather high. Barometer very low on the 6th; a sprinkling of S on the 17th and 19th; large floods on 5th, 25th and 27th; fogs on 16th, 17th and 23rd.

BURY ST. EDMUNDS, WESTLEY.—S on 18th. The month has been wet and mild, and the past year has been the wettest year except 1872 (with 33·18 in.) in my 40 years' record, which I have now completed.

NORWICH, BRUNDALL.—Damp, gloomy and unsettled during the first fortnight, with rain daily; more seasonable in the third week. The last week stormy; bright and rainy days alternating.

WEYMOUTH, LANGTON HERRING.—The weather almost throughout the month has been very wet and unsettled. The mean temp. (39°·9) was as nearly as possible equal to the average. Stormy weather on the 4th, 5th, 6th and 13th. Fogs on the 21st, 26th and 30th. Lunar halo on the 14th.

TORQUAY, CARY GREEN.—Rainfall 4·09 in. above the average. Mean temp. 42°·8, or 0°·2 below the average. Duration of sunshine 40 hours 30 minutes, being 13 hours below the average; 11 sunless days. The rainfall for the year has been 8·02 in. below the average.

POLAPIT TAMAR [LAUNCESTON].—The wettest December during the past 16 years, the total fall exceeding the average by 2·52 ins.

STROUD, UPFIELD.—Gale on 9th. On 17th, a snowstorm at 2.30 p.m. (S ½-inch deep). Gale at night of 29th.

WOOLSTASTON.—A wet month, with a good deal of frost. Wild gale on the night of the 8th and 9th. S fell lightly on the 18th and 19th.

TENBURY, ORLETON.—A rather wet month, with an unusual amount of wind, temperature about the average. S only once, on the 17th. A cold spell from the 16th to 24th, during which time there was practically no thaw, though on no day did the thermometer remain below 32° all day. Frequent fogs and gales. During the last 65 years we have only had 4 drier ones than 1896—viz., 1844, 1854, 1864 and 1887.

LEICESTER, BARKBY.—A month of frequent rain and very variable Barometrical readings. Mean temp. 37°·5. S on 18th.

MANCHESTER, PLYMOUTH GROVE.—Dense fog on the 16th and 21st. A fall of snow on the 17th. End of the month as mild as May.

ARNCLIFFE.—A wet month, unusually free from snow.

SEATHWAITE.—Very wet from 23rd to 31st, total 14·56 in. 4·59 in. fell on 29th, 2·89 in. on 24th, 2·13 in. on 25th, and more than an inch on 27th and 30th.

WALES.

HAVERFORDWEST.—December commenced cold and gloomy, and much R every day up to the 18th. From the 4th to the 8th was excedingly stormy. On the 5th, from 9 a.m. to 12, the Barometer stood at 29·01 in.; with that exception, from the 5th onward the mercury was below 29 in. for 51 hours. Frost, alternated with storm and rain, during the whole of that period. S covered the Precelly range from the 15th to the 21st. From the 21st to the end, very wet and gloomy, with higher temperature.

ABERYSTWITH, GOGERDDAN.—Very wet throughout, and very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—Very changeable weather has prevailed during the month, the range of Bar. pressure approaching 1½ inches. A sharp spell of frost was experienced between the 16th and 23rd, the mean temp. for those eight days being 30°·5; during the remaining eight days of the month the mean temperature averaged 41°·1. During the nights of the 30th and 31st stiff breezes blew from S W.; light winds, however—mostly easterly—generally prevailed. Aurora was observed on the 15th, and T was heard on 31st. Sunshine was only registered during 37 hours, and there were 16 entirely sunless days. The unsettled weather has not been favourable to stock wintered out of doors, and sheep folded on turnips have had anything but comfortable quarters; the mild weather experienced during the last few days of the month has, however, freshened up pastures, and farm work generally is well advanced.

JEDBURGH.—The leading feature of the weather has been its variableness, changes often twice a day. Little sun, but little fog; out-door work not much retarded. Little ailment in the community. Pink and white primrose in bloom on 26th; snowdrops appearing above ground 28th; snowdrops and yellow aconite in bloom on 31st.

COLMONELL.—Rainfall 2·26 in. above the average for 20 years. Mean temp. 1°·0 above the average. H on 12th and 15th. S on 15th and 16th.

ABERDEEN, CRANFORD.—The wind has been very light, and foggy weather right through the month, hardly one day bright.

S. RONALDSAY, ROEBERRY.—A very wet, windy month.

IRELAND.

DARRYNANE ABBEY.—Wettest month since November, 1892. Very sharp frost 16th, to morning of the 20th, rest of month rather mild, especially latter part. Very strong gale, force 11 Beaufort scale, for about five hours, on afternoon of 30th. H on 16th.

WATERFORD, BROOK LODGE.—Large Lunar Halo on 12th, S on the Comeragh and Carlow Mountains on 14th.

O'BRIENSBRIDGE, ROSS.—A considerable rainfall, making up for November deficiency. Temp. generally mild, only some light frosts, and of short duration.

DUBLIN.—A generally unsettled, open, rainy month. Mean temp. 41°·4, or 0°·1 above the average. Solar halos on 4th, 13th and 14th; a lunar halo on the 23rd. High winds on 12 days, but attained the force of a gale on only two occasions, the 26th and 30th. Foggy on the 4th, 5th, 11th, 13th, 20th and 22nd. No S or sleet. H on the 9th and 18th. Aurora borealis on the 3rd.

CLIFDEN, KYLEMORE.—The roughest month of the year, with rain, storm, and frost. The flood has been the highest for many years.

WARINGSTOWN.—A wet, mild month, except the third week, when there was a sharp frost.

OMAGH, EDENFEL.—The first fortnight was mild and rainy, with one or two short frosty intervals, the third week fine, clear and frosty, with little or no snow; the temp. on the night of the 18th fell to 14° in the stand, and to 10° on the surface of the ground. A remarkably sudden and complete change took place on the 24th, and the year terminated in persistent and continuous wet.

END OF VOL. XXXI.